PCT/EP 2004/007440

Component for a circuit board and method for inserting said component into a circuit board

Description

The present invention relates to a component for a circuit board, having a housing on which at least one peg is designed for engaging in a hole in the circuit board, whereby the peg has at least one detent lug which projects in the radial direction relative to the peg beyond its outer periphery, according to the preamble of claim 1. The invention also relates to a method for inserting a component of this type into a circuit board, according to the preamble of claim 6.

In order to equip a circuit board with components, for some components, it is necessary additionally to fasten them mechanically to the circuit board with a peg having a latching device. By this means, the peg penetrates a hole in the circuit board, whereby a detent lug on the penetrating end of the peg latches onto the side of the circuit board opposed to the component and thereby mechanically fixes the component once it has been inserted. It is, however, disadvantageous herein that the placement force alone is 10 N, which cannot be achieved with conventional component inserting machines. This applies all the more to the force required for latching, which is usually in the range of 60 N to 110 N. Therefore, formerly such components have had to be inserted and latched manually. However, this entails a high cost.

It is an object of the invention to improve a component and a method of the aforementioned type such that fitting and locking of this component in a circuit board can be carried out by machine reliably and at low cost.

This aim is achieved according to the invention with a component of the aforementioned type having the features disclosed in claim 1 and by a method having the process steps disclosed in claim 6. Advantageous embodiments of the invention are disclosed in the further claims.

With a component of the aforementioned type, it is provided according to the invention that the detent lug is designed and arranged on the peg such that the outer periphery of the peg is smaller in the region of the detent lug than the diameter of the hole in the circuit board, whereby the outer periphery of the section of the peg protruding into the hole in the circuit board is designed such that between the outer periphery of this section and the inner wall of the hole in the circuit board, over at least a portion of the outer periphery there is an intermediate space with capillarity for solder, such that solder situated on the surface of the circuit board during a soldering procedure penetrates by capillary action into the intermediate space, filling it.

With a method of the above type, the following steps are provided according to the invention: application of soldering paste on the circuit board round at least a portion of the periphery of the hole, placement of the component onto said circuit board with the peg in the hole in said circuit board, heating of the solder arranged round the hole such that the solder penetrates by capillary action into the intermediate space with capillarity, and cooling of the solder which has penetrated into the hole, such that it hardens.

This has the advantage that for fitting and locking the component on the circuit board, it is not necessary to apply a particularly great force, so that this work can be carried out automatically by machine in a production line

for circuit boards with a component inserting machine and a hot air furnace, whereby after the soldering procedure in the hot air furnace, locking of the component is automatically achieved by the solder that has penetrated into the hole in the circuit board. At the same time, a tolerance-free form-fit takes place between the peg and the inner periphery of the hole in the circuit board in a plane of the circuit board. The insertion of components with locking can therefore be carried out very economically, simultaneously producing large holding forces and with little tolerance.

A form-fitting connection without tolerance in the direction along a longitudinal axis of the hole in the circuit board is thereby achieved that the detent lug is designed and arranged on the peg such that with the component placed fully on the circuit board, the detent lug is arranged within the hole in the circuit board.

For further promotion of the capillary action, the periphery of the peg is designed in the longitudinal direction over the whole section situated in the hole in the circuit board with at least one cut-out.

A particularly good form-fit between the solder penetrating into the hole in the circuit board and the circuit board is thereby achieved that the hole in the circuit board is metallised.

The peg is made, for example, of plastics, so that no mechanically strong connection between said peg and the solder arises.

The invention will now be described in greater detail by reference to the drawings, in which:

Fig. 1 shows a plan view of a preferred embodiment of a component placed on a circuit board,

Fig. 2 shows a view of the detail X of Fig. 1 before a soldering procedure,

Fig. 3 shows a sectional view along the line A-A of Fig. 2,

Fig. 4 shows a view of the detail X of Fig. 1 after a soldering procedure, and

Fig. 5 shows a sectional view along the line B-B of Fig. 4.

Fig. 1 shows a preferred embodiment of a component for a circuit board 32. The component comprises a housing 10 onto which two pegs 28 are formed. In Fig. 1, the component is placed on the circuit board 32, whereby each peg 28 engages in a metallic hole 30 in the circuit board 32.

Figs. 2 and 3 additionally illustrate the condition of the component inserted into the circuit board before the soldering procedure, whereby metallising 56 of the hole 30 is visible. Soldering paste 50 is applied round a portion of the periphery of the hole 30 and the peg 28 protrudes into the hole 30. The peg 28 has a detent lug 52 formed at its free end, whereby the diameter of the peg 28 is smaller in the region of the detent lug 52 than the inner diameter of the hole 30. Also in the remaining section of the peg 28, which engages in the hole 30, the diameter of the peg 28 is designed to be smaller than the inner diameter of the hole 30. In addition, the length of the peg 28 is selected such that with the component placed fully into the circuit board 32, the detent lug 52 is still situated within the hole 30, as is apparent in particular in Fig. 3. Additionally, the peg 28 is provided with cut-outs 54 in the longitudinal direction, as shown in particular in Fig. 2. The smaller diameter of the peg 28 compared with the hole 30 and the cut-outs 54 are chosen such that between the outer periphery of the peg 28 and the inner periphery

of the hole 30, an intermediate space with capillary properties is formed.

In a manufacturing process wherein firstly all components are placed by a component inserting machine into the circuit board 32 and subsequently a soldering procedure takes place in a hot air furnace, the solder 50 is heated and passes to the liquid phase. The liquid solder 50 then penetrates, by means of the capillary effect and additionally supported by an adhesion force, into the intermediate space between the outer periphery of the peg 28 and the inner periphery of the hole 30 and essentially fills it completely. Before the soldering procedure, the solder 50 is herein arranged on non-metallised regions round the hole 30, whereby corresponding adhesive forces are produced in the direction of the hole 30.

Figs. 4 and 5 show the condition following cooling and hardening of the solder 50. The intermediate space is filled with solder 50 and the solder 50 has become bound to the metallising 56 of the hole 30 in form-fitting manner. This alone produces a form-fitting connection between the circuit board 32 and the peg 28 in a plane of the circuit board 32. Additionally, by means of the detent lug 52, a form-fit in the direction of the longitudinal axis of the hole 30 is produced, that is, in a direction perpendicular to the circuit board 32. Overall, therefore, the peg 28 is firmly connected or locked to the circuit board 32 in all three spatial directions. This connection is also able to absorb turning moments without the peg 32 becoming loosened from the hole 30. As is immediately apparent, however, no insertion force or latching force has to be applied to achieve this. Locking has been automatically achieved during the soldering procedure. It is also apparent that

the connection between the peg 28 and the circuit board 32 is tolerance-free.